MARS MICROPHONE 2016: A UNIQUE OPPORTUNITY FOR STUDENT INVOLVEMENT

[*]A. MINIER[1], [*]W. RAPIN[1], D. PEREZ ESCOBAR[1], D. MIMOUN[1] and the Mars Microphone Team [2]

[1]*Institut Supérieur de l'Aéronautique et de l'Espace,* *Undergraduate Students 2 see bit.ly/MM2016 for the team description

General outline

The Mars Microphone is an E/PO experiment proposed in the frame of the ExoMars Entry and Descent Module of the ExoMars Trace Gas orbiter. It aims at retrieving the first sounds ever recorded from Mars. Besides of the technical and science team, its development involves undergraduate and graduate students. The experiment will be built on the heritage of previous Mars microphone experiments led by Berkeley SSL and the Planetary Society. The main scientific objectives include basic atmospheric investigation, analysis of dust devils and wind vortexes and the capture of sounds related to atmosphere electrical activity and meteoritic impacts.

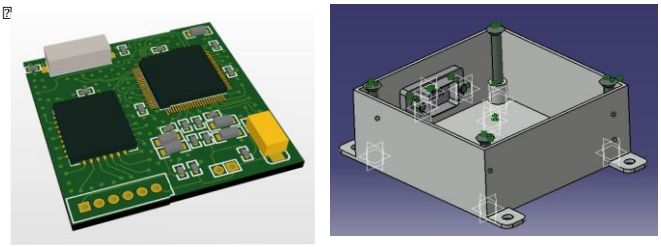

Figure 1 : Preliminary In-House design

Design of the Mars Microphone

The microphone relies on a simple and robust design, a small mass (about 50g) and size (50x50x20mm) and a low power budget (around 150mW). It is based on a very limited set of well-known and previously space-qualified components in order to minimize development risks. From a functional point of view, the microphone is a very simple and robust state machine, fully under the control of the CEU. Its life duration in the surface operational phase will be very short, about 4 days, thus reducing risks of failure and development constraints. Three different configurations including up to three microphones for extended science experiments are considered, depending on the possible on-board resources allocation.

Student contributions

The simple design and development approach of the Mars Microphone combined with the exciting perspective of its mission make it an ideal support for education at University level. Students will be (and are already!) deeply involved at all stages of the development, operations and post-flight analysis of the instrument's mission, as shown on the following diagram:

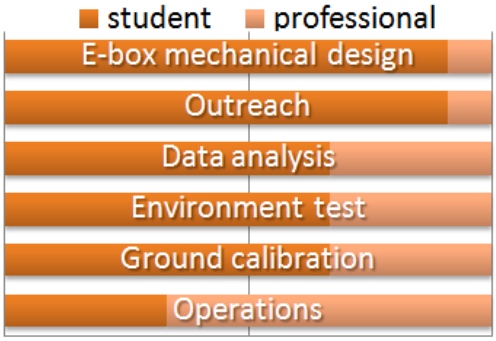

Figure 2 : Student involvement overview

While waiting for the payload selection, we are currently setting up an experiment for ground calibration tests carried out in a pressurized Martian Simulation Chamber. This set-up will allow performing realistic measurements of the propagation of acoustic waves in the Martian atmosphere and will give us a keener understanding of the scientific phenomena to be detected on Mars by the microphone. It will also give us a preliminary validation of the signal to noise ratio.

Other on-going activities include the electronics design, the design of the mechanical box, contribution to various environment test setups and reports, and participation in outreach activities.

References

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[4] Sparrow, V. W. (1999): Acoustics on the planet Mars: A preview. *The Journal of the Acoustical Society of America,* 106**,** 2264.